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Water and Waste Management

EPA

Industrial Effluent Standards

A Major Step in Improving Water Quality

CLEAN WATER

EPA

The Effluent Guidelines Division has the lead in developing industrial effluent limitations and pretreatment standards that will contribute to the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waterways. These include those activities mandated by the 1977 Clean Water Act, the specific requirements of the NRDC "Settlement Agreement," and an expanding involvement in the Agency's integrated waste management and toxics control strategy.

To obtain additional information on this program, please write directly to:

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Introduction

Although a decade of concerted effort has notably improved many U.S. waterways, the fact remains that over half of our river basins are still affected by pollution. This pollution includes hundreds of elements, ranging from relatively simple algae scums to highly toxic stews of industrial and chemical wastes. The sources of these pollutants are just as diverse—industrial plants, animal feedlots, mining operations, waste treatment facilities, landfills, and agricultural runoff. Among industrial facilities alone, almost 35,000 plants discharge process wastewaters directly into U.S. waterways; another 40,000 plants discharge wastewater to some form of publicly owned treatment works. As the kepone disaster in Virginia has taught us, these industrial wastes constitute an environmental time bomb. Improperly or ineffectively treated, they are an invisible threat to public health and safety.

Because of their potentially hazardous and pervasive environmental effects, industrial wastes have become the principal focus of pollution control efforts by the Environmental Protection Agency (EPA). This booklet highlights those aspects of Federal law that deal with industrial pollution. It explains how EPA's Effluent Guidelines Division (EGD) develops limitations for pollutants and applies them to various industries, and also how the public can participate in the development process.

Background

Treating and controlling industrial wastes in the context of a national program poses some very difficult problems. Each of hundreds of industries discharges different wastes. Waste streams within an industry also can vary; even a single plant can produce a number of different effluents. Industrial use of water itself varies enormously. Some facilities discharge as little as a few hundred gallons per day, others may use and discharge more than 200 million gallons per day.

Some plants generate relatively benign wastes. The effects of these are known, and they can be treated successfully by well-known methods. Other plants discharge pollutants whose effects are as yet unpredictable, or that combine adversely with other wastes and chemicals, or that do not yet have any practical or effective treatments.

The most basic problem, however, involves the identification of the pollutants themselves—what are they? Until recently, water quality was determined by chemical analysis of a few substances. Most of the toxic pollutants were unknown, and there were no methods to monitor for them. Yet we now know that some of these chemicals appear and have toxic effects at concentrations as low as one part per billion. How can we even detect such compounds, much less establish limitations for them? A related issue is the definition of toxic. What constitutes a toxic pollutant and how should it be handled?

In 1972, Congress resolved some of these issues with the passage of the Federal Water Pollution Control Act Amendments. This landmark legislation firmly established the principle of uniform national controls over individual pollution sources. Under EPA's direction, these controls were to be implemented through three major programs:

- Expansion of service and improvement of efficiency in publicly owned treatment works (POTW)
- The issuance of permits to discharge wastewater (National Pollutant Discharge Elimination System – NPDES permits)
- The promulgation of national standards limiting the discharge of pollutants (effluent guidelines limitations)

These standards, to be developed by EPA's Effluent Guidelines Division, were to be based on four phases of treatment represented by:

BPT—best practicable control technology currently available. BPT generally represents the average of the best existing waste treatment performance within an industry category or subcategory. The deadline for compliance was July 1, 1977.

BAT—best available technology economically achievable. BAT represents the highest degree of demonstrated control and treatment technology available to an industry category or subcategory. The deadline for compliance is July 1, 1983.

NSPS—new source performance standards. NSPS represents the best available demonstrated control technology, processes, operating methods, or other alternatives. Compliance is to be achieved when the new source begins operating. (A new source is any source whose construction begins after the promulgation of regulations applying to such a source.)

PSES—pretreatment standards for existing sources. PSES apply to facilities discharging pollutants into municipal treatment plants and are intended to remove those industrial wastes that might create problems in sewers, interfere with sewage treatment processes, pass untreated into waterways, or pass into treatment plant sludge, rendering it unfit for disposal or beneficial use.

In addition to these controls on discharges specific to each industry, the Act also required control of toxic discharges from all industrial sources. These controls were to be based on the nature of the pollutants rather than the technologies available to each industry.

Several problems arose from this approach, particularly in developing limitations for toxic pollutants. The 1972 Act had established a procedure by which EPA was to identify toxic pollutants and issue effluent standards, but clashing interpretations and scarce toxicological data embroiled the Agency in a series of court tests.

These legal debates, coupled with a new recognition of the threats posed by different pollutants, led Congress to revise the 1972 Act.

Although the 1977 Clean Water Act basically retains the requirements of the 1972 Act, it also introduces several important new provisions. These include provisions for EPA to regulate site management practices, to encourage alternative or innovative technologies, and to establish effluent limitations based on technology *and* pollutant categories.

EPA's water programs now regulate three distinct classes of pollutants—conventional, toxic, and nonconventional. Each of these has its own rationale for treatment and follows its own sequence of technology-based limitations and compliance deadlines.

Conventional pollutants include BOD (biological oxygen demand), suspended solids, pH, oil and grease, fecal coliform, and any other pollutants that EPA defines as conventional. These pollutants are controlled by effluent limitations based on a new technology category – BCT. BCT represents the best conventional pollutant control technology and replaces BAT for the control of conventional pollutants. In developing limitations based on BCT, EGD must use a "cost-reasonableness" test, which compares the costs and benefits of reducing conventional pollutants at POTW with the costs and benefits of reducing them at the industrial source. The deadline for achieving BCT limitations is July 1, 1984.

The question of toxic pollutants has been settled by legislative fiat – the 1977 Act specifically labels as toxic an initial list of 65 pollutants and classes of pollutants (see Appendix 1). These are controlled by limitations based on BAT; the compliance deadline is July 1, 1984, or 3 years after a substance is placed on the toxic pollutant list by EPA.

Nonconventional pollutants include all pollutants not classified by EPA as either toxic or conventional. Nonconventional pollutants are also controlled by limitations based on BAT. The compliance deadline is July 1, 1984, or within 3 years of the date EGD establishes effluent limitations, but not later than July 1, 1987.

How Standards are Developed

The development of limitations for these pollutant classes is a complicated process that must conform to overlapping legislative requirements and instructions.

The most basic requirements are those of the Clean Water Act itself. The Act directs EGD to develop limitations for each of at least 21 major industrial categories (see Appendix 2). Based on specific statutory criteria, each of these may be divided into subcategories that also require effluent limitations.

The limitations themselves are based on complex engineering studies to determine the technical and economic capabilities of each industry. These studies are summarized in development documents and economic impact analyses that:

- Analyze typical industry waste loads
- Identify significant pollutants and their effects
- Assess the entire range of measures available to control and treat these pollutants
- Estimate the economic costs and non-water quality environmental impacts of possible regulations
- Recommend limitations and standards of performance based on the appropriate technologies

All of these factors must be reviewed in light of specific considerations required under the Act, as well as EGD's engineering judgments.

EGD publishes these studies when the proposed limitations for each industry appear in the *Federal Register*; at that time, they also become available for study in the Public Information Reference Units at EPA headquarters and regional offices. In addition, EGD circulates the documents for review to governmental agencies, public interest and environmental groups, and industries and trade associations directly affected by the proposed limitations.

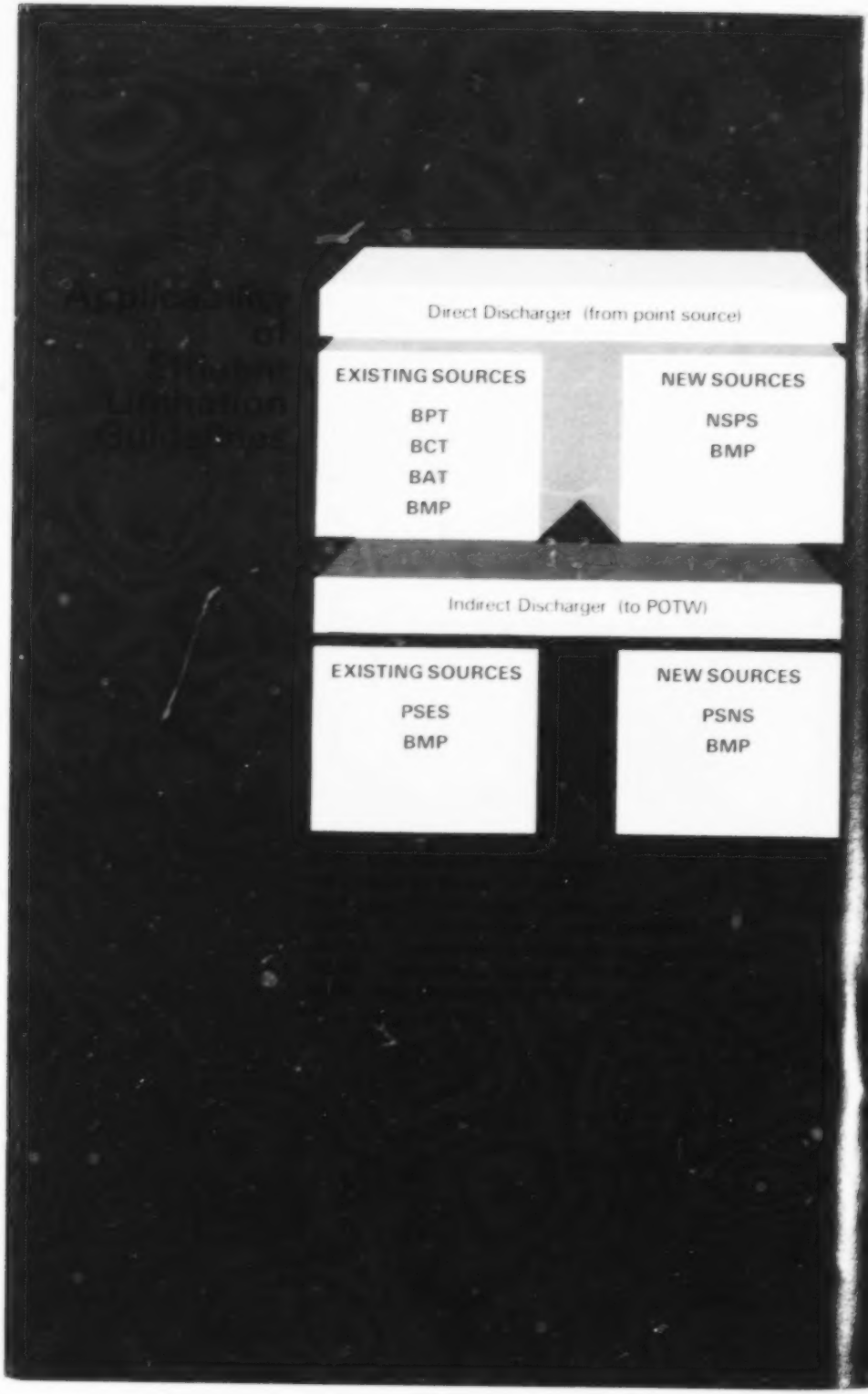
After the limitations are proposed, there is a period of time for public comment. Questions, issues, and problems raised at this

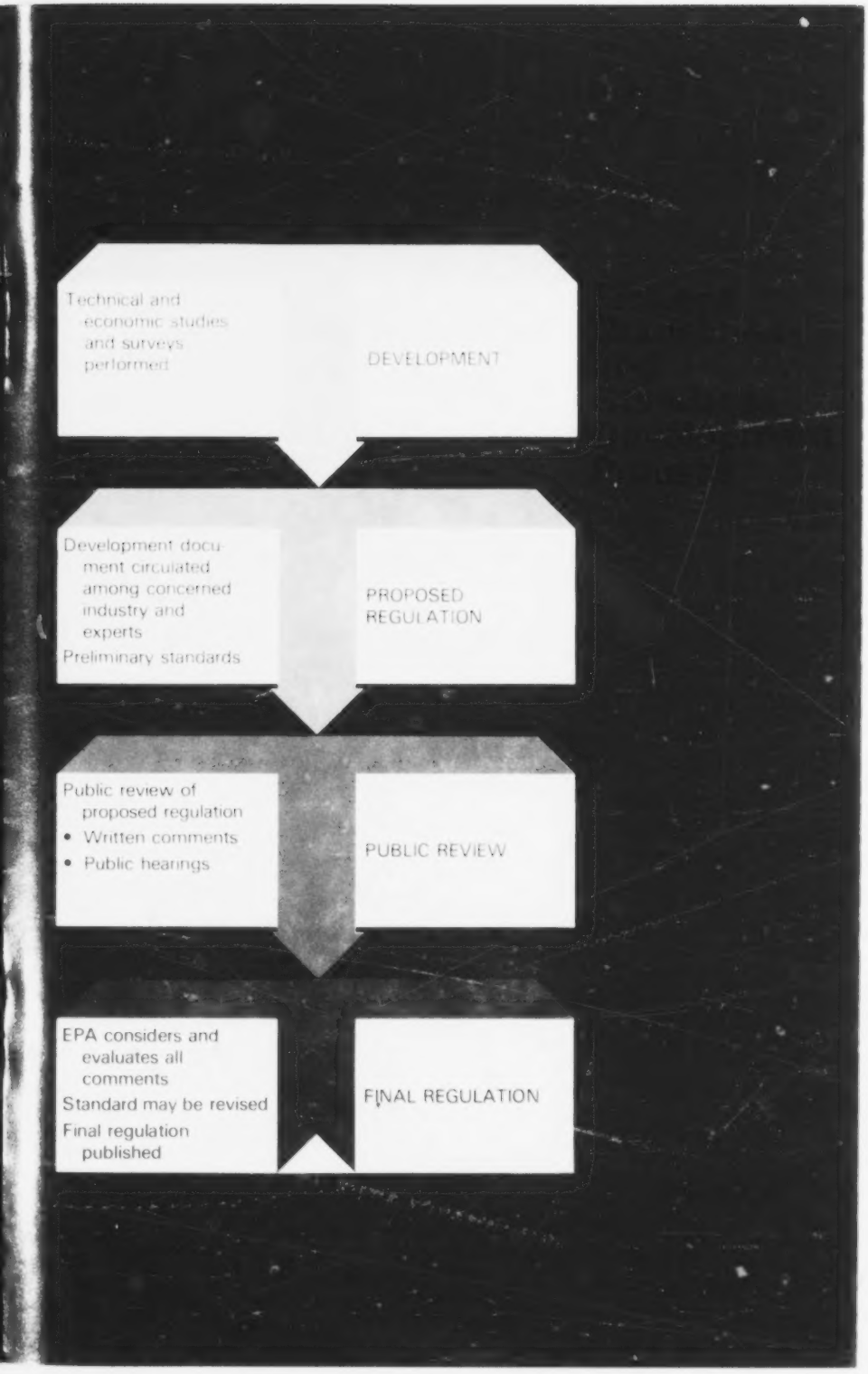
point are considered by EGD and, if necessary, the proposed regulations are modified to reflect new information. EPA then promulgates final limitations and standards that also are published in the *Federal Register*.

National Pollutant Discharge Elimination System (NPDES)

To ensure the proper implementation of EPA regulations, all point sources of pollution are required to obtain a discharge permit, issued under the National Pollutant Discharge Elimination System (NPDES). EPA has the basic authority to issue NPDES permits but may delegate this authority to any State that agrees to implement all NPDES program requirements. Basically, the permit translates effluent limitations and standards into specific requirements for each point source of pollution, prescribing the maximum allowable rate of discharge and the maximum allowable concentration or amount of each pollutant. The NPDES permit also sets forth other pollution abatement requirements, grants variances, develops a schedule for compliance and monitoring, and establishes reporting requirements to ensure compliance. NPDES permits are required for all municipal and industrial dischargers; they must be renewed, and possibly upgraded, every 5 years.

The Clean Water Act of 1977 requires that EPA or the States publicly report all dischargers not in compliance with their permits. Failure to meet any requirements in the NPDES permit, including any compliance schedule, constitutes a violation of the permit and carries severe civil and criminal penalties.


Direct Discharger (from point source)
EXISTING SOURCES
BPT
BCT
BAT
BMP
NEW SOURCES
NSPS
BMP
Indirect Discharger (to POTW)
EXISTING SOURCES
PSES
BMP
NEW SOURCES
PSNS
BMP


Technical and economic studies and surveys performed
DEVELOPMENT
Development document circulated among concerned industry and experts
Preliminary standards
PROPOSED REGULATION
Public review of proposed regulation
• Written comments
• Public hearings
PUBLIC REVIEW
EPA considers and evaluates all comments
Standard may be revised
Final regulation published
FINAL REGULATION

Appendix 1
Priority Pollutants*

acenaphthene
acrolein
acrylonitrile
benzene
benzidine
carbon tetrachloride (tetrachloromethane)
Chlorinated benzenes (other than dichlorobenzenes)
- chlorobenzene
- 1,2,4-trichlorobenzene
- hexachlorobenzene

Chlorinated ethanes (including 1,2-dichloroethane, 1,1,1-trichloroethane and hexachloroethane)
- 1,2-dichloroethane
- 1,1,1-trichloroethane
- hexachloroethane
- 1,1-dichloroethane
- 1,1,2-trichloroethane
- 1,1,2,2-tetrachloroethane
- chloroethane

Chloroalkyl ethers (chloromethyl, chloroethyl and mixed ethers)
- bis (chloromethyl) ether
- bis (2-chloroethyl) ether
- 2-chloroethyl vinyl ether (mixed)

Chlorinated naphthalene
- 2-chloronaphthalene

chlorinated phenols (other than those listed elsewhere; includes trichlorophenols and chlorinated cresols)
- 2,4,6-trichlorophenol
- parachlorometa cresol

**The italicized compounds represent the classes of pollutants listed in the Settlement Agreement. Those compounds indented are the specific compounds on the list of priority pollutants.*

chloroform (trichloromethane)
2-chlorophenol
Dichlorobenzenes
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
Dichlorobenzidine
3,3'-dichlorobenzidine
dichloroethylenes (1,1-dichloroethylene and 1,2-dichloroethylene)
1,1-dichloroethylene
1,2-trans-dichloroethylene
2,4-dichlorophenol
dichloropropane and dichloropropene
1,2-dichloropropane
1,3-dichloropropene
2,4-dimethylphenol
Dinitrotoluene
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
ethylbenzene
fluoranthene
Haloethers (other than those listed elsewhere)
4-chlorophenyl phenyl ether
4-bromophenyl phenyl ether
bis (2-chloroisopropyl) ether
bis (2-chloroethoxy) methane
Halomethanes (other than those listed elsewhere)
methylene chloride (dichloromethane)
methyl chloride (chloromethane)
methyl bromide (bromomethane)
bromoform (tribromomethane)
dichlorobromomethane
trichlorofluoromethane
dichlorodifluoromethane
chlorodibromomethane
hexachlorobutadiene
hexachlorocyclopentadiene
isophorone
naphthalene
nitrobenzene
Nitrophenols (including 2,4-dinitrophenol and dinitrocresol)
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-o-cresol
Nitrosamines
N-nitrosodimethylamine
N-nitrosodiphenylamine
N-nitrosodi-n-propylamine
pentachlorophenol
phenol
Phthalate esters
bis (2-ethylhexyl) phthalate
butyl benzyl phthalate
di-n-butyl phthalate
di-n-octyl phthalate
diethyl phthalate
dimethyl phthalate

Polynuclear aromatic hydrocarbons

- benzo (a) anthracene (1,2-benzanthracene)
- benzo (a) pyrene (3,4-benzopyrene)
- 3,4-benzofluoranthene
- benzo (k) fluoranthene (11, 12-benzofluoranthene)
- chrysene
- acenaphthylene
- anthracene
- benzo (ghi) perylene (1,12-benzoperylene)
- fluorene
- phenanthrene
- dibenzo (a,h) anthracene (1,2,5,6-dibenzanthracene)
- ideno (1,2,3-cd) pyrene (2,3-o-phenylenepyrene)
- pyrene

tetrachloroethylene

toluene

trichloroethylene

vinyl chloride (chloroethylene)

Pesticides and metabolites

- aldrin
- dieldrin
- chlordane (technical mixture & metabolites)

DDT and metabolites

- 4,4'-DDT
- 4,4'-DDE (p,p'-DDX)
- 4,4'-DDD (p,p'-TDE)

Endosulfan and metabolites

- a-endosulfan-Alpha
- b-endosulfan-Beta
- endosulfan sulfate

Endrin and metabolites

- endrin
- endrin aldehyde

Heptachlor and metabolites

- heptachlor
- heptachlor epoxide

Hexachlorocyclohexane (all isomers)

- a-BHC-Alpha
- b-BHC-Beta
- g-BHC (lindane)-Gamma
- d-BHC-Delta

Polychlorinated biphenyls (PCB's)

- PCB-1242 (Arochlor 1242)
- PCB-1254 (Arochlor 1254)
- PCB-1221 (Arochlor 1221)
- PCB-1232 (Arochlor 1232)
- PCB-1248 (Arochlor 1248)
- PCB-1260 (Arochlor 1260)
- PCB-1016 (Arochlor 1016)

Toxaphene

- antimony (Total)
- arsenic (Total)
- asbestos (Fibrous)
- beryllium (Total)
- cadmium (Total)
- chromium (Total)
- copper (Total)
- cyanide (Total)
- lead (Total)
- mercury (Total)
- nickel (Total)
- selenium (Total)
- silver (Total)
- thallium (Total)
- zinc (Total)
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

Appendix 2 Industries Being Studied

- **Auto and Other Laundries**
- **Coal Mining**
- **Electroplating**
- **Inorganic Chemicals**
- **Iron and Steel Manufacturing**
- **Leather Tanning and Finishing**
- **Machinery and Mechanical Products**
  - Aluminum Forming
  - Battery Manufacturing
  - Coil Coating
  - Copper Forming
  - Electrical and Electronic Products
  - Foundries
  - Mechanical Products
  - Nonferrous Metals Forming
  - Photographic Equipment and Supplies
  - Plastics Molding and Forming
  - Porcelain Enameling
  - Shipbuilding
- **Miscellaneous Chemicals**
  - Adhesives and Sealants
  - Carbon Black
  - Explosives Manufacturing
  - Gum and Wood Chemicals
  - Pesticide Manufacturing
  - Pharmaceutical Manufacturing
- **Nonferrous Metals**
- **Ore Mining**
- **Organic Chemicals**
- **Paint and Ink Formulation and Printing**
- **Paving and Roofing**
- **Petroleum Refining**
- **Plastics and Synthetic Materials**
- **Pulp and Paper**
- **Rubber**
- **Soaps and Detergents**
- **Steam Electric**
- **Textile Mills**
- **Timber Products Processing**

Appendix 3
Glossary

Act – The Clean Water Act.

BAT – The best available technology economically achievable, applicable to effluent limitations to be achieved by July 1, 1984, for industrial discharges to surface waters, as defined by Section 304(b)(2)(B) of the Clean Water Act.

BCT – The best conventional pollutant control technology, applicable to discharges of conventional pollutants from existing industrial point sources, as defined by Section 304(b)(4) of the Clean Water Act.

BMP – Best management practices, as defined by Section 304(e) of the Clean Water Act.

BOD_5 – Biological oxygen demand, defined as a conventional pollutant in the Clean Water Act.

BPT – The best practicable control technology currently available, applicable to effluent limitations to be achieved by July 1, 1977, for industrial discharges to surface waters, as defined by Section 304(b)(1) of the Clean Water Act.

Clean Water Act – The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251 et seq.), as amended by the Clean Water Act of 1977 (Pub. L. 95-217).

Conventional Pollutants – Constituents of wastewater as determined by Section 304(a)(4) of the Clean Water Act, including, but not limited to, pollutants classified as biological oxygen demand, suspended solids, oil and grease, fecal coliform, and pH.

Effluent Limitation – A maximum amount per unit of production (or other unit) of each specific constituent of the effluent that is subject to limitation from an existing point source.

EGD – Effluent Guidelines Division, Office of Water and Waste Management, EPA, the division responsible for the development of the industrial effluent limitations and standards.

Federal Water Pollution Control Act Amendments of 1972 – Pub. L. 92-500, which provides the legal authority for current EPA water pollution abatement projects, regulations, and policies. The Federal Water Pollution Control Act was amended further in 1977 in legislation referred to as the Clean Water Act.

NPDES – National Pollutant Discharge Elimination System, a Federal program requiring industry and municipalities to obtain permits to discharge plant effluents to the Nation's water courses, under Section 402 of the Clean Water Act.

NSPS – New source performance standards, applicable to industrial facilities whose construction is begun after the publication of the proposed regulations, as defined by Section 306 of the Act.

Point Source – Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged.

POTW – Publicly owned treatment works, facilities that collect, treat, or otherwise dispose of wastewaters, owned and operated by a village, town, county, authority, or other public agency.

Pretreatment Standard – Industrial wastewater effluent quality required for discharge to a publicly owned treatment works.

PSES – Pretreatment standards for existing sources of indirect discharges, under Section 307(b) of the Clean Water Act.

PSNS – Pretreatment standards for new sources of indirect discharges, under Section 307(b) and (c) of the Act.

Settlement Agreement – Agreement entered into by EPA with the Natural Resources Defense Council and other environmental groups and approved by the U.S. District Court for the District of Columbia on June 7, 1976. One of the principal provisions of the Settlement Agreement was to direct EPA to consider an extended list of 65 classes of pollutants in 21 industrial categories in the development of effluent limitations guidelines and new source performance standards.

Toxic Pollutants – All compounds specifically named or referred to in the Settlement Agreement, as well as recommended specific compounds representative of the nonspecific or ambiguous groups or compounds named in the agreement. This list of pollutants was developed based on the use of criteria such as known occurrence in point source effluents, in the aquatic environment, in fish, in drinking water, and through evaluations of carcinogenicity, other chronic toxicity, bioaccumulation, and persistence.

TSS – Total suspended solids, defined as a conventional pollutant in the Clean Water Act.

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